OPERATING INSTRUCTIONS

MODEL TTS 39D DISTRIBUTION AMPLIFIER

NORTHEAST ELECTRONICS CORPORATION
AIRPORT ROAD
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Concord, New Hampshire

TABLE OF CONTENTS

	Section	Page
Model TTS 39D Distribution Amplifier		
General Description	1.0	1
Transmission Performance	2.0	1
Controls and Adjustments	3.0	1
Circuit Description	4.0	2
Maintenance and Trouble Shooting	5.0	2-3
Installation Instructions	6.0	3
Schematic Diagrams		
Appendix - TTS 39XB Output Amplifier Circuit		
General Description	1.0	1-2
Circuit Description	2.0	2-3
Maintenance and Trouble Shooting	3.0	3-4
Schematic Diagrams		
Table of Replaceable Parts		

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MODEL TTS 39D DISTRIBUTION AMPLIFIER

OPERATING INSTRUCTIONS

1.0 GENERAL DESCRIPTION

1.01 The Model TTS 39D Distribution Amplifier is designed to operate in conjunction with the Model TTS 39 Series of Reference Tone Generators for those installations requiring additional output circuits.

1.02 The Model TTS 39D basic panel is equipped with a transistorized buffer circuit to provide isolation between the output amplifier module of this unit and the oscillator circuits of the associated milliwatt generator. This buffer circuit also provides an output for driving a second Model TTS 39D unit; thus, these units can be operated in cascade as required.

1.03 Terminals and mounting space are provided to accommodate up to four of the Model TTS 39XB Output Amplifier Units. Battery power, switching, fusing, and reverse battery protection for the output amplifier units are provided on the TTS 39D basic panel. The basic panel is also equipped with test jacks to monitor the input and output of the buffer amplifier circuit. A pilot lamp is included to provide a power ON indication.

1.04 For a description of the TTS 39XB Output Amplifier Unit refer to the Appendix which is a part of this manual.

1.05 The Model TTS 39D is designed to mount in a standard 19" rack, requires 5¼" of rack space and is powered by 48 volts DC. Current requirements are approximately 80 ma for the basic panel and 25 ma for each output amplifier module.

2.0 TRANSMISSION PERFORMANCE

2.01 The performance of this unit is dependent upon that of the milliwatt generator providing the signal input and that of the output amplifier module. The buffer amplifier circuit, for all practical purposes, is not affected by normal temperature or battery voltage variations.

3.0 CONTROLS AND ADJUSTMENTS

3.01 The following switches and jacks appear on the front panel of the TTS 39D:

1. POWER switch: turns power ON and OFF.
2. INPUT jack: to monitor signal from milliwatt generator.
3. BUFFER OUT jack: to monitor signal out of buffer amplifier circuit.

4. COARSE and FINE level controls: these controls are associated with the output amplifier modules and serve to set the output level.

4.0 CIRCUIT DESCRIPTION

4.01 This description covers the operation of the TTS 39D basic panel. A schematic diagram of this unit is shown in Dwg. #C60673. For a description of the output amplifier module refer to the instruction manual supplied with the TTS 39 Series of Reference Tone Generators.

4.02 The signal input from the milliwatt generator is applied to the base of transistor Q-1 through DC blocking capacitor C-3. Transistor Q-1 is operated as an emitter follower to provide circuit isolation between the milliwatt generator and the output amplifier circuits. Resistors R-3 and R-4 provide base bias for Q-1, and resistor R-5 serves as the emitter load resistor. The output signal appearing across the emitter load resistor is coupled to the input of the amplifier circuits through DC blocking capacitor C-2.

4.03 Collector voltage for Q-1 is taken from the junction of power resistors R-1 and R-2. Capacitor C-1 provides battery filtering and decoupling.

4.04 Power switching is provided by toggle switch S-1. Diode CR-1 provides reverse battery protection and fuse F-1 current overload protection. Pilot lamp PL-1 serves as a power ON indication.

4.05 The jack identified as INPUT provides access to the signal input from the milliwatt generator for test purposes. The jack identified as BUFFER OUTPUT provides access to the output of the buffer amplifier circuit for test purposes. This point is also extended to the terminal strip to provide for the operation of a second TTS 39D unit.

5.0 MAINTENANCE AND TROUBLE SHOOTING

5.01 Apart from occasional checks on the output level, the TTS 39D does not require any routine maintenance.

5.02 If one or more of the output amplifiers are operating normally, trouble shooting should be centered on the defective output module. Refer to the milliwatt generator manual for the output amplifier trouble shooting procedure. A schematic diagram of the TTS 39D is shown in Dwg. #C60673, and a component placement diagram is shown in Dwg. #C60718.

5.03 Pilot lamp PL-1 should light when the POWER switch is ON; if it does not, check the fuse (and for reverse battery in a new installation).

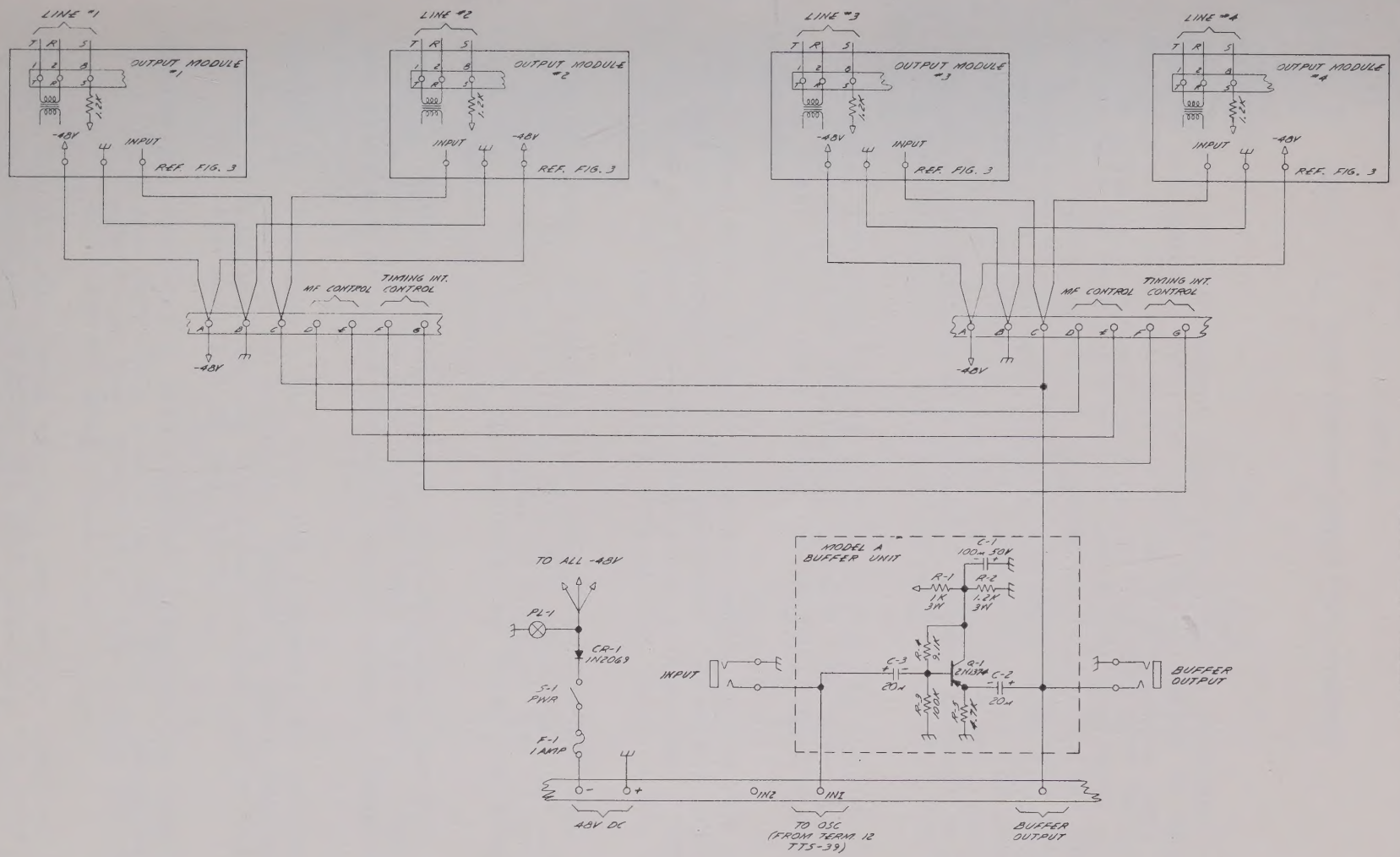
5.04 The signal input voltage from the milliwatt generator, as measured at the INPUT jack with a VTVM, should be in the order of 1.1 volts RMS. The same holds true for signal level as measured at the BUFFER OUTPUT jack. If no signal or low signal voltage is observed at the INPUT jack, most likely either Q-1 is shorted or the milliwatt generator is defective. If proper signal level is observed at the INPUT jack but not at the BUFFER OUTPUT jack, the trouble will be found in the buffer circuit consisting of transistor Q-1 and associated circuitry. The collector voltage of Q-1 should be between 25 and 30 volts DC. The DC voltage of the emitter of Q-1 should be approximately 15 volts.

6.0 INSTALLATION INSTRUCTIONS

6.01 Before attempting to connect and operate the Model TTS 39D Distribution Amplifier Unit, perform a visual inspection of the unit to insure that damage has not been caused during shipment, such as components being pushed together, etc.

6.02 Necessary wiring interconnections are shown on the schematic diagram of this unit.

REVISIONS				SIZE	REV
				CONT ON SHEET	SH NO
ZONE	SYM	DESCRIPTION	DATE	APPROVAL	
	1	MINOR CHANGES	8-6-64	BWK	



ITEM	REQ'D	PART NO	DESCRIPTION	MATL	MATL SPEC
			LIST OF MATERIAL		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ✓ ±½° ALL SURFACES
MATERIAL
FINISH
PAINT
SCREEN PER

DRAWN	LEO B. GAGNON
DATE	8-7-64
APPD	
ISSUED	
APPROVED	DATE
ENGR	
MFG	
MATL	

SCHEMATIC
DISTRIBUTION AMPLIFIER

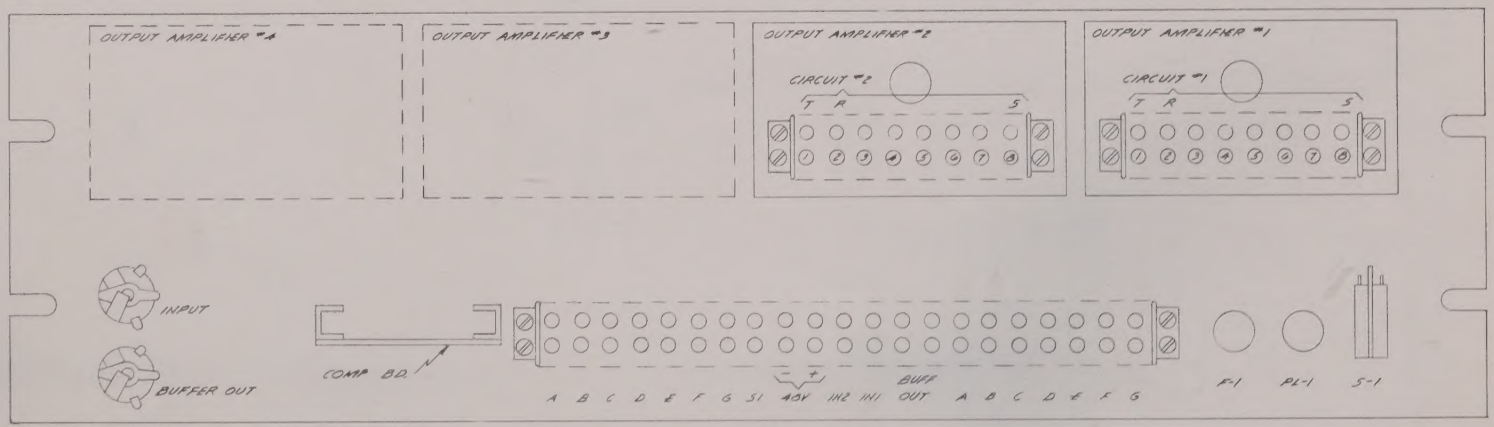
TTS-39D

SCALE | WT CALC. ACTUAL

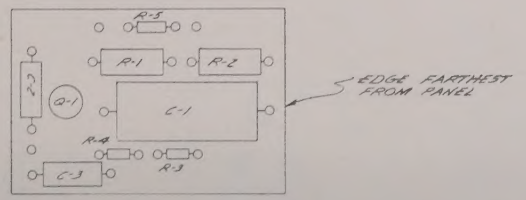
NORTHEAST ELECTRONICS CORP.
CONCORD, N. H.
REF. NO. C-1191
SIZE C 60673
CONT ON SHEET SH NO

FIG. 6

REVISIONS			SIZE	REV
			CONT ON SHEET	SH NO
ZONE	SYM	DESCRIPTION	DATE	APPROVAL



REAR



COMPONENT BOARD

ITEM	REQ'D	PART NO	DESCRIPTION	MATL	MATL SPEC

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ±1/64 DECIMALS ± .005 ANGLES ±½°
ALL SURFACES
MATERIAL
FINISH
PAINT
SCREEN PER

DRAWN Leo B. Gagnon
DATE 11-2-64
APPD.
ISSUED

APPROVED	DATE
ENGR	
MFG	
MATL	

PANEL ASSEMBLY

TTS-39D

SCALE WT CALC ACTUAL

NORTHEAST ELECTRONICS CORP.
CONCORD, N. H.
REF. NO. C-1157
SIZE C 60718
CONT ON SHEET SH NO

Fig. 6A

APPENDIX

MODEL TTS 39XB OUTPUT AMPLIFIER CIRCUIT

1.0 GENERAL

1.01 The Model TTS 39XB Output Amplifier Unit is designed to operate in conjunction with the Model TTS 39 Series of Reference Tone Generators or with the Model TTS 39D Distribution Amplifier Unit. Both models can accommodate up to four TTS 39XB Output Amplifier Units, each of which can provide an output impedance of 600 or 900 ohms. The output impedance is selected by installing the proper straps. Resetting of the output level is necessary when the output is changed from one impedance value to another. The level in each output circuit is independnet of the load applied to the other circuit. The output of each circuit is normally 0 dbm, and both coarse and fine adjustments are provided in each channel to permit setting the output level to any desired value from -1.0 dbm to +2.0 dbm.

1.02 Each Model TTS 39XB Output Amplifier Unit is provided with a TEST jack to monitor the output level. The insertion of a test cord in these jacks disconnects the output from the associated input switching or jacks.

1.03 These units are in modular form and mount on the TTS 39 or TTS 39D panel utilizing holes provided. Terminal strip positions are also provided for the electrical connections, thus eliminating the need for any soldering when adding these units in the field.

1.04 Battery power, switching, and fusing for the TTS 39XB units is provided by the TTS 39 or TTS 39D, whichever the case may be. The output signal and sleeve lead is brought out to screw type terminals on the rear of the modules; as these are screw type, there is no soldering required.

1.05 Options. The following options are available for use in conjunction with the TTS 39XB Output Amplifier Unit. Mounting space and holes are provided for easy installation. These options are as follows.

Option 1 - Provides a gas tube for tripping the ringing. No hold is included. Mounting space has been provided on the individual module units for the addition of gas tubes.

Option 2 - Provides a hold coil for tripping the ringing and providing a hold on the line. Mounting space has been provided on the module for the addition of hold coils.

*Option 3 - Provides hold circuits and relays required to provide ON HOOK-OFF HOOK cycling; the hold coil also trips the ringing. This option is

normally used only in conjunction with the TTS 39B; if an external source of interruptions is available, Option 3 may also be used with the TTS 39A. The start circuits contained in Option 3 may also be used to start frequency cycling when the TTS 39XF is used with the TTS 39B. A schematic of this circuitry is shown in Fig. 8. Mounting holes are provided on individual modules for the mounting of component boards containing the above circuitry.

*Option 4 - Provides start circuits for initiating frequency cycling when the TTS 39XF is used in combination with the TTS 39A or the TTS 39B. This option is not required when Option 3 is provided. A schematic diagram of this option is shown in Fig. 7. Mounting holes have been provided on the individual modules for the mounting of component boards containing the above circuitry.

*Option 5 - Combination of Options 1 and 4 for use with the TTS 39A.

*Option 6 - Combination of Options 2 and 4 for use with the TTS 39A.

*These options are not applicable to the Model TTS 39BAE.

Other options are available, such as standard terminations, called party release, and other terminations. As these other options are normally individually tailored to customer specifications, specific details have not been included in this manual.

2.0 CIRCUIT DESCRIPTION

2.01 The Model TTS 39XB Output Amplifier Unit consists of a highly stabilized buffer amplifier, a cascaded emitter follower stage, and a ringing voltage protection network mounted individually within a protective enclosure. These units can be arranged in the field for either 600 or 900 ohm operation. Output levels are adjustable over a range from -1 dbm to +2 dbm. The circuit diagram to which the following description applies is shown in Dwg.#40478. A component diagram is shown in Dwg#C60698.

2.02 The input from the common oscillator unit is coupled to the Q-1 buffer amplifier stage through potentiometers R-3 and R-17. These controls provide the COARSE and FINE adjustment of the output level. Capacitor C-1 provides DC blocking for the base circuit of transistor Q-1. The output of the Q-1 buffer amplifier stage appears across the collector load resistor R-6, and in turn is coupled to the cascaded emitter follower stage through blocking capacitor C-2. The signal voltage appearing across the R-10 emitter load resistor of transistor Q-3 is coupled to output transformer T-1

through DC blocking capacitor C-3. Precision resistors R-12 and R-13 provide the impedance buildout for either 600 or 900 ohm operation. The 600 ohm condition exists when resistor R-13 is strapped out of the circuit over terminals marked Z. The non-polarized electrolytic capacitor, C-4, provides DC blocking for the output circuit. Diodes CR-1 and CR-2 and resistor R-11 constitute the ringing voltage protection network.

2.03 The output of transformer T-1 is coupled to terminals 1 and 2 of the terminal board located on the rear of the unit. This circuit is carried over contacts of the test jack. When plugged into the test jack, all external circuits are disconnected by the interrupter springs of the test jack.

2.04 Resistors R-14, R-15, and capacitor C-5 provide voltage division and filtering for the output amplifier circuit. Resistor R-16 serves as the sleeve resistance to battery for the external circuit connected to the module.

3.0 MAINTENANCE AND TROUBLE SHOOTING

3.01 When one output circuit is inoperative and the others are functioning normally, it can be assumed that the preceding oscillator and thermistor driving circuit is operating satisfactorily. Trouble shooting should be conducted on the inoperative output stage as follows:

1. With reference to Dwg. #B40478, substitute transistors Q-1, Q-2, and Q-3, then recheck for output. If trouble still exists, advance both output level controls (COARSE and FINE) to their full clockwise positions. With the unit on, check the DC voltage at the negative end of capacitor C-5, it should read 24 volts DC ±10%. Connect the high side of a VTVM to the junction of R-2 and R-5 (base of Q-1) and the low side to ground. The AC signal voltage at this point should be in the order of .5 volts RMS. If it is not, trouble will probably be found in the output level adjustment controls or the DC blocking capacitor C-1. Excessive output level is an indication of an open resistor or defective oven unit.

2. If the signal voltage measured at the base of Q-1 is found to be normal, measure the signal voltages appearing at the collector of Q-1 and the emitters of Q-2 and Q-3. The AC signal voltages at these points should be in the order of 2.8 volts RMS. If these voltages are found to be normal, connect the high side of the VTVM to terminal 4 (green lead) of transformer T-1 and the low side to terminal 1 (black and white lead) of transformer T-1. The AC signal voltage should read in the order of 2.8 volts RMS (no load on output). If no signal appears at this point, check DC blocking capacitor

C-4 and transformer T-1 for an open circuit. If the signal voltage measured is low and capacitor C-4 is found to be normal, check transformer T-1 for shorted turns by measuring the DC resistance of the windings. With the transformer in the circuit (power removed from the unit), the following resistances should be realized; if they are not, replace the transformer.

Terminal 5 to Terminal 8	40-60 ohms
Terminal 1 to Terminal 2	20-30 ohms
Terminal 3 to Terminal 4	20-30 ohms

The above readings are approximate and will vary with individual transformers.

3. Should the signal voltage measured at terminals 1 and 4 of T-1 be normal, then capacitor C-4 and resistors R-12 and R-13 should be checked. Contacts of test jack J-1 must make a good connection in order for the signal to reach the ring and tip contacts on the terminal board. No signal should appear on the terminal board when a plug is inserted into the test jack.

4. After trouble has been corrected, readjust the COARSE and FINE adjustment controls to the desired output level. Oven must be at normal operating temperature for this adjustment.

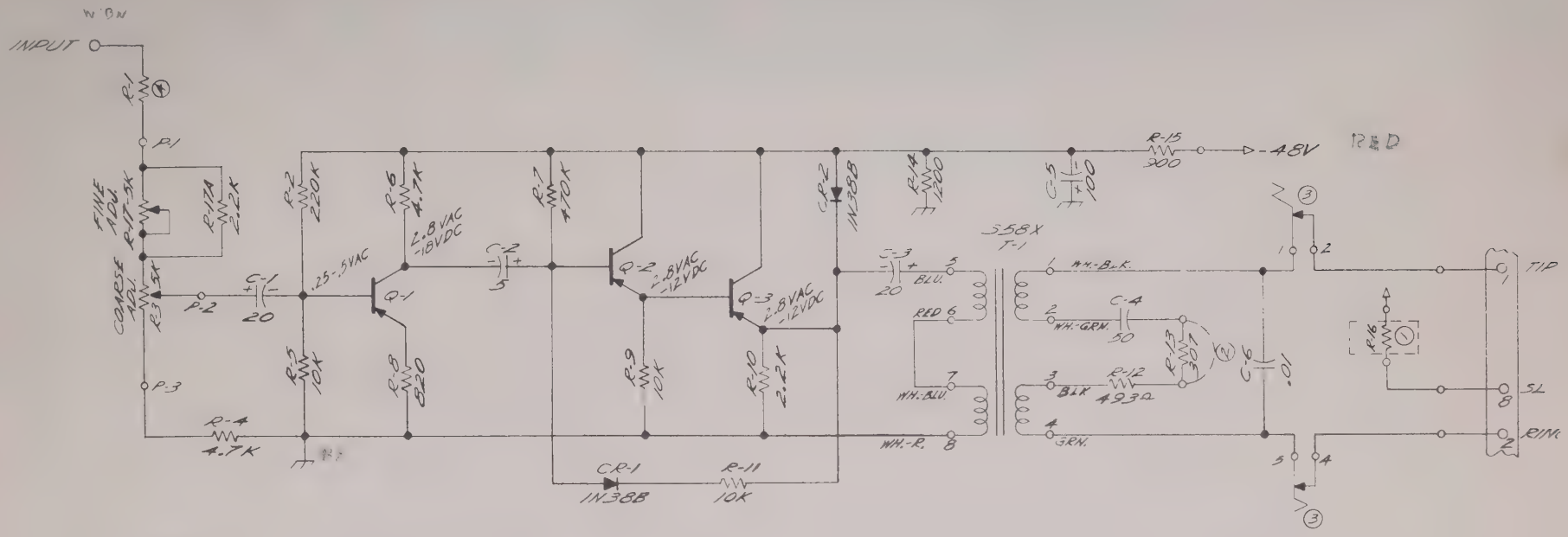
5. To check the ringing voltage protection network, consisting of diodes CR-1, CR-2, and resistor R-11, disable the oscillator by removing transistor Q-1. Apply ringing voltage to output ring and tip terminals. Measure the DC emitter voltage of Q-3. This voltage should be within 2 volts of the collector voltage of Q-3; if it is not, locate and replace the defective component within this network. It is important that this network be in proper operating order, as this supplies the ringing voltage protection to transistors Q-2, Q-3, and capacitor C-3.

REV	SIZE	CONT ON SHEET	SH NO

REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
3	REDRAWN	8-19-64	K.A.S

INPUT LEVEL -0.3 db



NOTES:

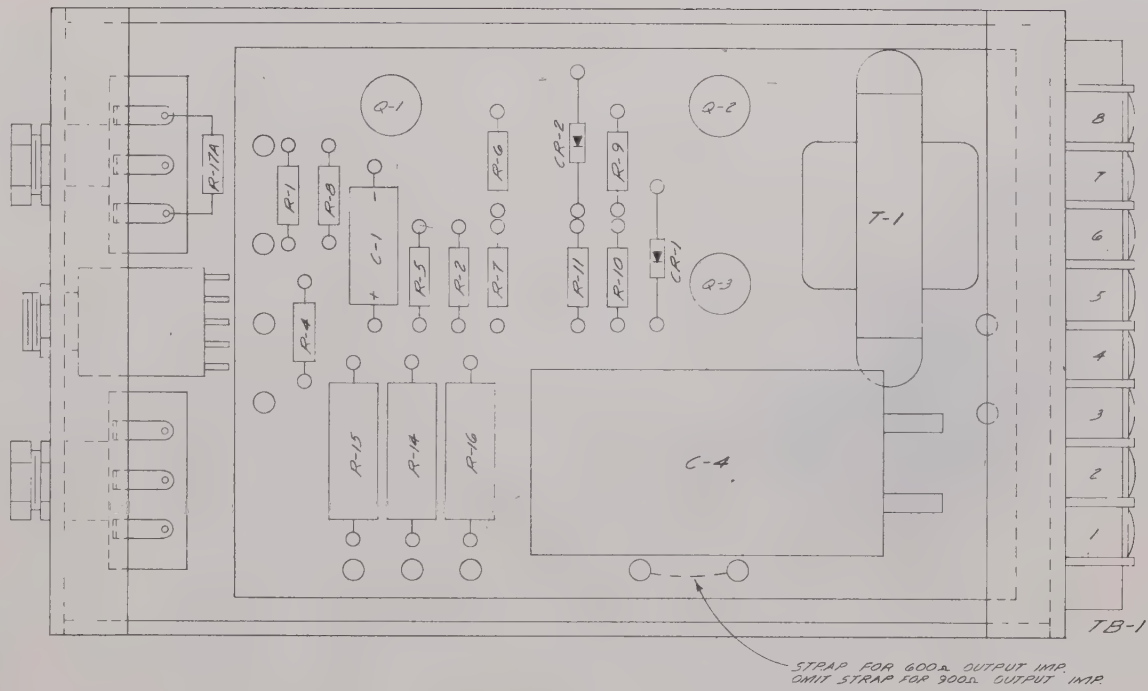
1. SLEEVE RESISTANCE NORMALLY SUPPLIED = 1200Ω
2. INSERT STRAP FOR 600Ω, REMOVE FOR 900Ω
3. TEST JACK
4. SELECTED VALUE TO PROVIDE DESIRED OUTPUT RANGE

NEC-E-95023 P.C.

FIG. 3

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/64 DECIMALS ±.005 ANGLES ±½° ALL SURFACES	DRAWN K.A. SMITH DATE 8-14-64 APPD ISSUED	SCHEMATIC OUTPUT AMPLIFIER	NORTHEAST ELECTRONICS CORP CONCORD, N. H.
MATERIAL	APPROVED / DATE	TTS-39XB	REF. NO. B-
FINISH PAINT SCREEN PER	ENGR MFG MATL	SCALE WT CALC ACTUAL	SIZE B 40478 CONT ON SHEET SH NO

REVISIONS				SIZE	REV
				CONT ON SHEET	SH NO
ZONE	SYM	DESCRIPTION	DATE	APPROVAL	



TOP VIEW

FIG. 3A

ITEM	REQ'D	PART NO	DESCRIPTION	MATL	MATL SPEC

LIST OF MATERIAL

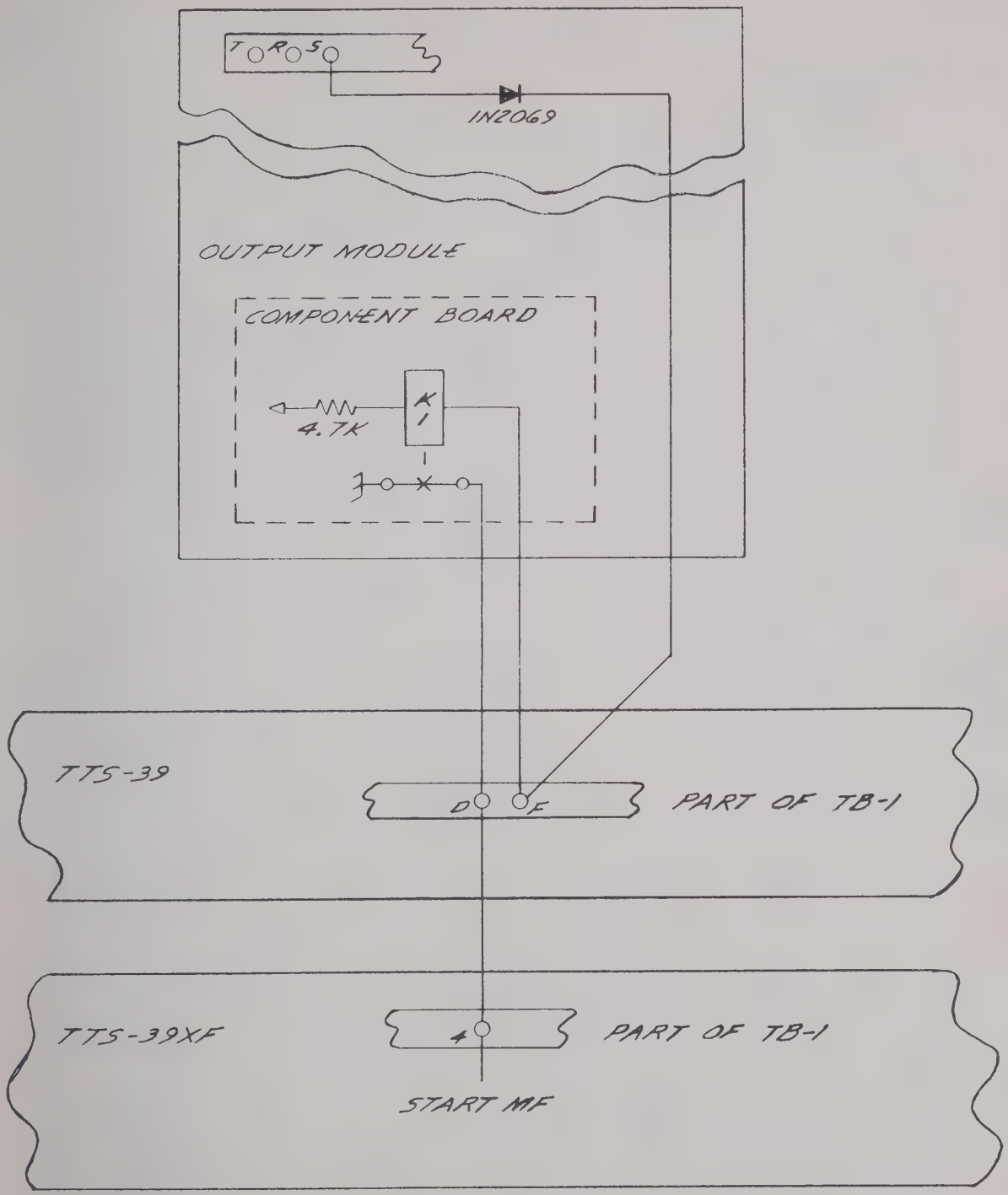
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS ±1/64 DECIMALS ± .005 ANGLES ±½
ALL SURFACES
MATERIAL
FINISH
PAINT
SCREEN PER

DRAWN Leo B. Gagnon
DATE 9-16-64
APPD.
ISSUED
APPROVED DATE
ENGR
MFG.
MATL
SCALE
WT CALC ACTUAL

OUTPUT MODULE ASSEMBLY

TTS-39

NORTHEAST ELECTRONICS CORP.
CONCORD N H
REF NO C-1191
SIZE C 60698
CONT ON SHEET SH NO



OPTION #4

FIG. 7
A-10798

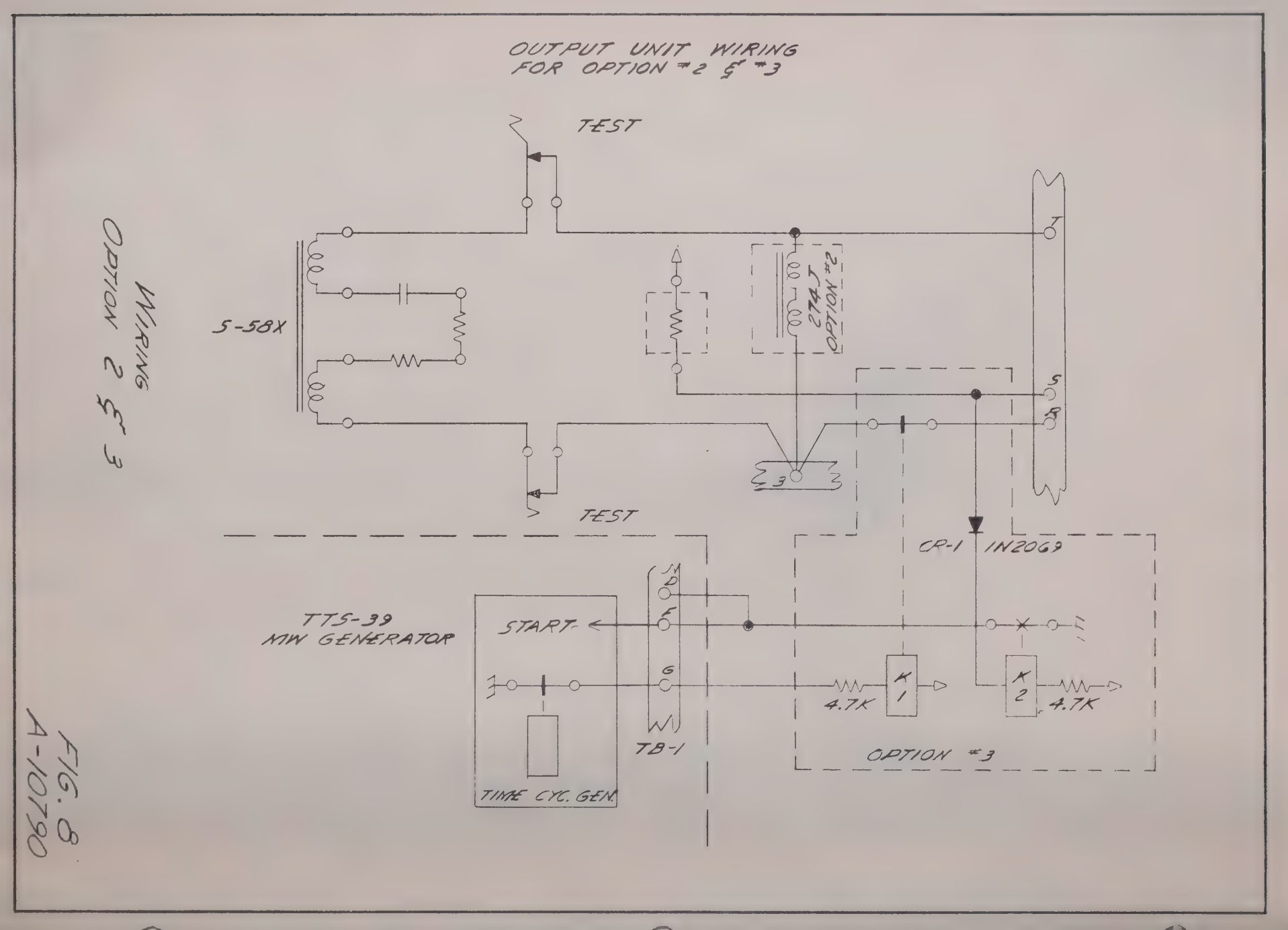

OUTPUT UNIT WIRING
FOR OPTION #2 & #3
TEST
S-58X
274T
OPTION #2
J
S
R
3
TEST
CR-1
IN2069
TTS-39
MW GENERATOR
START
D
E
G
TB-1
K
1
K
2
4.7K
4.7K
OPTION #3
TIME CYC. GEN.
WIRING
OPTION 2 & 3
FIG. 8
A-10180

TABLE OF REPLACEABLE PARTS

Model TTS 39D Distribution Amplifier Panel

Circuit Ref	Designation	Mfr* & Mfr's Designation
R1	Resistor: fixed, wirewound, 1 K ±10%, 3 w	J, PW-3
R2	Resistor: fixed, wirewound, 1.2 K ±10%, 3 w	J, PW-3
R3	Resistor: fixed, composition, 100 K ±5%, ½ w	B
R5	Resistor: fixed, composition, 4.7 K ±5%, ½ w	B
C1	Capacitor: fixed, electrolytic, 100 mfd, 50 vdc	J, TVA1310
C2	Capacitor: fixed, electrolytic, 20 mfd, 25 vdc	I, APD-046
C3	Capacitor: fixed, electrolytic, 20 mfd, 25 vdc	I, APD-046
Q1	Transistor	O, 2N1374
CR1	Diode: silicon	K, 1N2069
F1	Fuse Holder	C, HKP
	Fuse: 1 amp	K, 3AG-1A
PL-1	Pilot Light Assembly	H, 105-4428-722
	Lamp: 48-volt	H, 55-C
S1	On-Off Switch SPST	A, 20994-LH
TB1	Terminal Strip	E, 21-140 3/4w
J1	Input Jack	M, L-12B
J2	Buffer Output Jack	M, L-12B

Model TTS 39XB Output Amplifier

R1	Resistor: selected value	
R2	Resistor: fixed, composition, 220 K ±10%, ½ w	B
R3	Resistor: variable, 5 K	F, CM29064NP
R4	Resistor: fixed, composition, 4.7 K ±5%, ½ w	B
R5	Resistor: fixed, composition, 10 K ±5%, ½ w	B
R6	Resistor: fixed, composition, 4.7 K ±5%, ½ w	B
R7	Resistor: fixed, composition, 470 K ±10%, ½ w	B

Circuit Ref	Description	Mfr* & Mfr's Designation
R8	Resistor: fixed, composition, 820 ohms ±10%, ½w	B
R9	Resistor: fixed, composition, 10 K ±5%, ½ w	B
R10	Resistor: fixed, composition, 2.2 K ±5%, ½ w	B
R11	Resistor: fixed, composition, 10 K ±5%, ½ w	B
R12	Resistor: fixed, composition, 493 ohms ±1%, ½ w	J, CEC-TO
R13	Resistor: fixed, composition, 307 ohms ±1%, ½ w	J, CEC-TO
R14	Resistor: fixed, wirewound, 1.2 K ± 10%, 3 w	J, PW-3
R15	Resistor: fixed, wirewound, 900 ohms ±10%, 3 w	J, PW-3
R16	Resistor: fixed, wirewound, 1.2 K ±10%, 3 w	J, PW-3
R17	Resistor: variable, 5 K	F, CM29064NP
R17A	Resistor: fixed, composition, 2.2 K ±5%, ½ w	B
C1	Capacitor: fixed, electrolytic, 20 mfd, 25 vdc	I, APD-046
C2	Capacitor: fixed, electrolytic, 5 mfd, 50 vdc	L, TVA 1303
C3	Capacitor: fixed, electrolytic, 20 mfd, 25 vdc	I, APD-046
C4	Capacitor: fixed, electrolytic, 50 mfd, 75 vdc	L, D27359
C5	Capacitor: fixed, electrolytic, 100 mfd, 50 vdc	I, APD-127
C6	Capacitor: fixed, disc, .01 mfd, 500 vdc	D, 5GA-D10
CR1	Diode	N, 1N38BS
CR2	Diode	N, 1N38BS
Q1-Q3	Transistors	O, 2N1375
T1	Transformer: Line to Line	P, S-58X
J1	Output Jack	M, 54-SF
TB1	Terminal Strip	E, 8-140 3/4w
	Printed Circuit Board	B, E-95023

*See List of Manufacturers Code Letters for Replaceable Parts Table

LIST OF MANUFACTURERS CODE LETTERS FOR REPLACEABLE PARTS TABLE

Code Letter	Manufacturer
A	Arrow-Hart and Hegeman Electric Company
B	Allen Bradley Company
C	Bussman Manufacturing Company
D	Centralab
E	Cinch Jones Manufacturing Company
F	Clarostat Manufacturing Company, Inc.
G	Defiance PrintedCircuit Corporation
H	Dialight Corporation
I	International Electronics Industries
J	International Resistance Company
K	Littelfuse, Inc.
L	Sprague Electric Company
M	Switchcraft, Inc.
N	Sylvania Electric Products, Inc.
O	Texas Instruments, Inc.
P	Triad Transformer Corporation

7841 - C
CO EQUIP CONST
MARVISTA CO